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Legitimating Genome Editing: A Critical Discourse Analysis of Media Reportage

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Abstract

This research employs Theo Van Leeuwen's legitimation framework of Critical Discourse Analysis to investigate how genome editing is legitimized in two select newspaper reports. The analysis focuses on the dominant discourses, justification techniques, power dynamics, ideologies, and social practices presented in these news reports. Genome editing is primarily justified as a ground-breaking scientific development with the possibility to revolutionise health and agriculture, according to the findings of a systematic analysis of language choices and claims of authority. This favourable ideological picture is supported by scientific data and professional advice from researchers and decision-makers, further solidifying their authority in the discourse. Nevertheless, there are clear power disparities, with scientists and policy-makers dominating the narrative and the general public's viewpoints and ethical concerns being under-represented. Dealing with language-related problems and solutions, this article has its applied relevance for institutional practices in education and the media.

Keywords: Genome editing, Legitimation, Newspaper reporting, Critical discourse analysis, Conventional linguistics, Social implications, Ideology

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Introduction

Genome editing or gene editing, especially through the revolutionary CRISPR-Cas9 technology, has garnered substantial attention for its prospect to bring transformative modifications to various fields, including agriculture, biotech and medicine. In order to provide a background to this paper, it is important to distinguish between genetically modified and gene-edited products since this work focuses on media reactions to the use of the CRISPR-Cas9 technology.

The production of genetically modified organism (GMO) and gene-edited foods falls within the purview of biotechnology, yet they diverge significantly in their genetic manipulation techniques. According to Karavolias, GMO foods are the outcome of incorporating new combinations of genetic material, often sourced from unrelated organisms, into the host organism's genome. This approach harnesses genetic material from diverse sources to enhance desired traits like nutritional content, yield, or resistance to diseases. (https://allianceforscience.org)

In contrast, gene-edited foods result from precise alterations made to the existing genetic material of the target organism, without the introduction of foreign DNA. Advanced tools like CRISPR-Cas9 facilitate the precise cutting and editing of DNA at specific loci, enabling researchers to modify genes with a high degree of accuracy and efficiency. Gene editing primarily aims to enhance or inhibit the function of native genes, impacting characteristics such as ripening, flavour, or allergenicity.

Asha Martin notes that both genetically modified and gene-edited foods possess potential advantages and drawbacks concerning human health, environmental impact, and societal implications. They are also subject to distinct regulatory frameworks and varying public perceptions across different nations and regions. Consumer preferences often hinge on personal values, beliefs, and inclinations, leading to a choice between these biotechnological methods or even outright rejection.

As genome editing technology advances, its legitimacy has become a crucial subject of analysis in the media discourse. Comprehending how genome editing is legitimized and justified in print media reports is important in comprehending the use of language as a vital tool for shaping of public perceptions, policy discussions, and societal approval of government decisions. Such information is readily available on the print media.

The media's account of genome editing can impact public understanding, garner public approval or opposition, and affect policy decisions that shape the future applications and laws of the technology. Generally, these media reports can greatly

impact public perception and acceptance of biotechnological advancements, including genome editing. The media's phrasing of ethical and social topics related to genome editing can control public attitudes toward the technology and its potential applications.

Critical discourse analysis, as proposed by Theo Van Leeuwen, gives a valuable framework for analysing the language, power relations, and ideologies embedded in media representations of genome editing. Using this paradigm to analyse print media reports can reveal the strategies used to legitimize genome editing and the participants involved in shaping its narrative.

Theoretical Framework

Critical Discourse Analysis (CDA) is an interdisciplinary framework that delves into the examination of power and ideologies in texts. Its primary goal lies in uncovering the concealed connotations, ideologies, power dynamics, and societal imbalances that influence conversations across diverse settings. CDA was created during the late 1970s and early 1980s as a reaction to the constraints of conventional linguistics, which focused solely on the formal and structural facets of language, neglecting its profound social and political implications. This methodology draws insights from an array of disciplines such as anthropology, text linguistics, philosophy, rhetoric, sociolinguistics, and sociology. Its aim is to scrutinize how language functions in constructing, perpetuating, questioning, or reshaping social realities.

Prominent figures in the realm of CDA include Norman Fairclough, Ruth Wodak, Gunther Kress, and Theo Van Leeuwen, among others. They have developed diverse theoretical and methodological frameworks to dissect discourse, such as critical linguistics, social semiotics, discourse-historical approaches, socio-cognitive approaches, and critical literacy. Nonetheless, these scholars share a common ground on the following goals of CDA:

1. Uncovering the concealed ideologies, power dynamics, and disparities inherent in discourse.
2. Investigating how discourse both influences and is influenced by societal practices, structures, and identities.
3. Evaluating the predominant discourses that either perpetuate or challenge social issues and injustices.
4. Empowering marginalized and oppressed groups to question and reshape the existing state of affairs.
5. Advocating for social change and democratic principles through discourse.

As one of the prominent figures in this field, Theo Van Leeuwen introduced a framework for examining how discourse legitimizes various aspects of society (2-6). This framework encompasses four primary classifications of legitimation: authorization, moral evaluation, rationalization, and mythopoesis. Each of these categorisations can be further divided into subtypes, depending on the source and manner of legitimization.

Van Leeuwen notes four essential types of legitimation:

1. Authorization: Legitimation based on the authority of people who hold institutional power as well as the authority of tradition, custom, and law.
2. Moral evaluation: It focuses on legitimation through referring to conversations of value. This may entail using words with desirable moral connotations, such as "fairness" or "justice," or by making reference to universal principles, such "the common good."
3. Rationalisation: It is the process of giving institutionalised social action its justification by pointing to its purposes and goals as well as the social knowledge that gives it its cognitive validity. This can be done by outlining the justifications behind a certain course of action or by demonstrating how it is done.
4. Mythopoesis: It involves telling tales of heroism to support the narrative.

In order to analyse a variety of texts, including political speeches, news articles, and advertisements, Van Leeuwen's paradigm has been employed by various researchers (97). In this study, Van Leeuwen's framework provides an in-depth comprehension of the ways by which ideological and social power are established and perpetuated in the media accounts of genome editing. (97)

Applying Van Leeuwen's framework to diverse texts and contexts within CDA can unveil how discourse either legitimates or delegitimizes specific societal practices. This, in turn, can influence the perceptions and actions of the audience. His analysis demonstrates how various forms of legitimation can evoke distinct responses, such as a sense of obligation, moral duty, rationality, or identification.

Furthermore, Van Leeuwen's legitimation techniques enable CDA to juxtapose and analyze different discourses and viewpoints regarding the same societal practice. This examination can shed light on how these discourses align with or challenge prevailing ideologies and power structures within society.

Review of Related Literature

This segment evaluates existing scholarly works that have been published on Gene Editing and climate change. Srimayi Tenali and Phil McManus employ CDA in assessing how the Sustainable Action Plans (SAP) of five municipalities in the coastal region of Florida acknowledge anthropogenic climate change and the wider consequences for sustainable development (1072). Their research reveals that important factors driving recognition of coastal climate change include pressure from the public, environmentalists, and recent climatic events that caused damage to infrastructure. The study also demonstrates that these states empowered their citizens more than those that saw climate challenges as the result of unavoidable external circumstances thereby focusing on local mitigation measures and opportunities.

Mosurska et al. advocate for the inclusion of indigenous people in disaster-management efforts. To gain a greater understanding of how professional media portray indigenous people in disasters, the researchers applied critical discourse analysis. Five results were identified by their research, one of which was that disasters were natural occurrences that should be dealt with by humanitarianism and technological initiatives. (178) According to the findings of Mosurska et al., discourses depoliticize disasters, make indigenous people helpless, and justify themselves by portraying governments and NGOs as being concerned about indigenous people.

In a research by Satoru Sukegawa et al, the SpCas12f element was used to edit the genome of rice, a global staple crop. Their procedure involved the introduction of genome elements into rice cultivation; and their findings show that SpCas12f is resourceful for rice genome editing. This paper is quite different from the current study because this work is focused on Critical Discourse Analysis.

Jay Clayton's reference book on science, literature, and public policy demonstrates how literature can affect public policy with regard to scientific debates in genomics and other fields. His writing dramatizes the full human complexity of these challenges, providing fresh insights into debates about genetic engineering, GMOs, and gene editing, among other topics. Using readings of writings by HG Wells and other literary giants of the Victorian era, this work demonstrates the relevance of literary studies to science debates. The text shows how literature could influence public policy, citing remarkable instances ranging from the literary reaction to the theory of evolution in the Victorian period through its later integration into genetics in the latter part of the 20th century to contemporary genome sequencing.

In response to a call from numerous scientists and interested parties within the Latin American and Caribbean (LAC) area, Roca Mara Mercedes et al. conducted a study encouraging legal administrators, regulators, science teachers, and the general society to accept GMO innovation and make second-generation biotechnologies available to those who might benefit the most, thus contributing to food security and to circular bio-economy. Their work urged the farming and food industries throughout the LAC region –the world's breadbasket and lungs– to implement urgent agricultural changes (Roca et al. 243).

Beumer Koen questions whether smallholder farmers make use of crop technology for gene editing like CRISPR and the likely motivations for the applications of this technology. The researcher explored gene editing projects that target small-time farmers, and examined their operations using the inclusive innovation paradigm. The research has three primary conclusions. First, these subsistent farmers may profit from using gene editing on their agricultural products. Second, the application of modifying genes for subsistent farmers is, at best, developing slowly. Third, the study makes the case that using the comprehensive innovation framework (as a check-list) could assist researchers and scholars in accessing information from subsistence farmers.

Donrich Thaldar and Bonginkosi Shozi examine the decision of the WHO Expert Advisory Group to recommend important principles to guide the creation of policies for Human Genome Editing (HGE), as well as providing suggestions on how HGE can be regulated. The study came to the conclusion that, while the WHO Expert Advisory Group makes some reasonable suggestions on global governance, liberal democratic states are not forced to adopt the WHO's strategy of emphasising HGE restrictions without also considering the importance of a free and liberal policy space in the global sphere.

In terms of the critical discourse analysis of the ideological perspectives of governments, GMO companies, and individual perceptions, this literature review reveals the need to address public fears and apprehension towards gene editing and the accompanying ethical considerations, as selected media reports represented from around the world. Therefore, this article aims to examine the media's presentation of significant ideological stances taken by governments and gene editing companies in the news media to allay public fears in order to promote the safety and benefits of applying modern trends in genetic engineering to meet the needs of everyday society.

Methodology

The data for this paper were sourced from online media coverage pertaining to genome editing as reported in two prominent newspapers, namely the *BBC* and *Punch Nigeria*. These newspapers, one with a national reach and the other of international stature, were chosen due to their comprehensive coverage of genome editing topics both within Nigeria and on a global scale.

In order to gather the necessary data for this study, a comprehensive search was conducted within the digital databases and archives of the selected newspapers. This search utilized specific keyword queries related to "gene-editing" and "genome editing." To ensure the relevance and contemporaneity of the collected data, the focus of data collection was restricted to news reports on gene editing published online during the most recent six-month period from the date of this writing (in 2023).

The dataset comprised five distinct news reports sourced from the aforementioned newspapers. However, owing to constraints related to analytical capacity and the need for objectivity and balance, a purposive sampling approach was employed. This approach led to the selection of a single news report from each newspaper for in-depth analysis. The reports are:

(a) "What is Gene-Edited Food and is it Safe to Eat?" written by Pallab Ghosh, *BBC News*, 23rd March, 2023. Labelled as EXTRACT 1

(b) "Nigeria Ready to Deploy Genome Editing Technology in Agriculture." Written by Tunde Ajaja, *Punch Nigeria*, 12th July 2023. Labelled as EXTRACT 2

For the subsequent analysis of the acquired data, Theo Van Leeuwen's Critical Discourse Analysis (CDA) framework was employed. This analytical framework was chosen for its suitability in dissecting and interpreting the discourse surrounding genome editing as presented in the selected news reports.

A. ANALYSIS OF LEGITIMATION STRATEGIES IN EXTRACT 1

Legitimisation by Authorisation

In the realm of authorisation, the article gives significant authoritative credence and validation strengthening the argument for the production, sale, and safety of gene-edited agricultural products. There are some key points:

1. Perception of Scientists as Authoritative Figures: The article references scientists and technological experts to legitimize the safety of gene-edited food. For example, when debating safety concerns, the essay remarks, "Scientists insist that each of the three years genetic techniques produces food that is safe to eat," resorting to the support of specialists in the field of genome editing.
2. Recognition of Government as Key Decision-makers: The article acknowledges the government's role in creating regulations to allow gene-edited food in England. It cites, "The government hopes the technology will boost jobs and improve food production," demonstrating that the decision to authorize the production of such food is supported by the government's belief in its benefits and safety.
3. Citing Existing Laws and Regulations: The article refers to the prescribed standards and statutes governing gene-edited food in the European Union (EU). It states, "Neither GM nor GE crops can be commercially produced or sold in the EU," implying that there are established standards that restrict the production and sale of genetically edited food in specific areas.
4. Adoption of Polling Data: The report quotes polling data carried out by YouGov on behalf of DEFRA, stating, "Recent unpublished polling by YouGov for Defra found that 54% said GE crops were 'acceptable,' while 28% said they were 'unacceptable.'" The use of this statistical data conveys public opinions on the acceptability of genome-edited foods.

Legitimisation by Rationalisation

The use of rationalization as a legitimisation technique helps in justifying logical reasons for the acceptance and safety of gene-edited varieties in the article, as shown in the following ways:

1. Presentation of Logical Arguments for Claims of Gene Editing Safety: The paper employs logical reasoning to validate the safety of genome-edited food by the quote, "Scientists insist that each of the three genetic techniques produces food that is safe to eat." This statement implies that safety assertions are built on scientific methods and study.
2. Positive Comparison with Established Methods: The report rationalizes gene editing as a quicker and more efficient method when placed side-by-side with conventional cross-breeding. It explains, "Genetic methods remove

the random element... develop the new variety much more quickly." This comparison underscores the precision and efficiency of the gene-edited process, marking it as advancement over existing procedures.

3. Reflection of Previous Consumption: To justify the safety of gene-edited varieties, the paper points to the 25-year production and consumption of gene-edited foods in Asian, North American, and South American countries without negative repercussions. By aligning these countries with their counterparts elsewhere, the article infers that gene-edited products are probably safe globally.
4. Emphasis on Indistinguishability: The essay treats gene-edited foods as being indistinguishable from natural varieties by citing, "Westminster considers them no different to conventional produce." This implies that there is no rationale to specifically label the goods as GMO or Genome edited because they serve the same purpose as the natural varieties.

Legitimisation by Moralisation

1. Through the tool of legitimisation by moralisation, the article makes a passionate defence of personal and public safety, ecological security, and economic growth as key benefits in the conversation about gene-edited products.
2. Moralising Well-being and Safety of Consumers. The write-up moralizes the production and consumption of gene-edited products by stating "Scientists insist that each of the three genetic techniques produces food that is safe to eat." This statement helps to appeal to the moral judgement of ensuring public health safety in the development of gene-edited products.
3. Ethical Valuation of the Welfare of Animals: The article demonstrates that the government and gene-editing companies take active steps in the ethical consideration of gene-edited animals and animal welfare in general.
4. Consequences on Ecology and its Sustainability: The article moralizes gene-edited agricultural products by evaluating the broader consequences of introducing genome edited organisms ecology, noting that anti-gene editing individuals are worried about "the impact GE crops could have on the environment."

Legitimisation by Mythopoesis

The writer applies narratives (referred to as mythopoesis in this study) to legitimize the safety and benefits of genome-edited crops for the environment and the economy. Here are some highlights:

1. Phrasing Genome Editing as a Progressive Advancement: The article uses mythopoesis by framing gene-edited products as an outstanding, ground-breaking procedure in contrast to orthodox cross-breeding. The paper details how genetic techniques extract the "random element" and generate new products more quickly. This description of advancement strengthens the notion that genome editing is a progressive, biological development in agriculture.
2. Accentuating International Illustrations as Success Stories and Public Approval: The piece utilizes mythopoesis by spotlighting international samples of gene-edited crops, like the Japan-grown tomatoes rich in GABA and US seedless blackberries. These success tales validate the existing record of favourable results and thriving implementation, further legitimizing the usage of genome editing in agriculture. Mythopoesis is employed in relaying public acceptance of genetically-edited crops. The paper shows polling data that cite public support for gene-edited foods as an ethical alternative in ensuring environmentally-beneficial and eco-friendly agricultural supplies.
3. Narratives Portraying the Safety of Genome-Edited Products: The essay utilizes mythopoesis to illustrate gene-edited agricultural products as rigorously experimented and safe for eating. It cites scientists who insist that each genetic technique produces safe food. The narrative portrays gene-edited food as thoroughly evaluated, and aligns it with established traditional breeding practices, thereby emphasizing its safety.

B. ANALYSIS OF LEGITIMATION STRATEGIES IN EXTRACT 2

Authorization

The article employs authorization strategies by referencing key persons, institutions, and stakeholders in the field of biotechnology and agriculture. This is perceived in:

1. Point: "The Director-General, National Biotechnology Development Agency, Prof Abdullahi Mustapha says, Nigeria will soon deploy genome editing technology in agriculture."

Authorization: The usage of the title "Director-General" along with the name and association of Prof Abdullahi Mustapha lends authority and credibility to the statement about Nigeria's intent to deploy genome editing technology in agribusiness.

2. Point: "Speaking in Abuja on Tuesday at the commencement of the validation workshop to review the draft of the genome editing national communication and advocacy strategy and action plan, Mustapha stated that as soon as the strategy was validated, Nigeria was ready for implementation."

   Authorization: The specific details furnished, such as the locale of the speech, the occasion of the validation workshop, and the connection, to the Director-General's statement, give the impression of an official and well-organized process, adding legitimacy to the plan for genome editing implementation.

3. Point: "At the programme, held in partnership with the African Union Development Agency, researchers were from various institutes and ministries, farmers, lecturers, civil society and faith-based organisations and regulators like the National Biosafety Management Agency."

   Authorization: Mentioning the involvement of respected organizations like the African Union Development Agency and various stakeholders from different sectors (researchers, agriculturalists, lecturers, civil society, and auditors) promotes the authority of the article and implies a wide consensus on the importance of genome editing technology.

Moralisation

In examining the essay using Theo Van Leeuwen's legitimation procedure of moralization, the study presents some statements as morally justified or morally questionable.

1. Point: "Nigeria will soon deploy genome editing technology in agriculture, which would help boost productivity and ensure food security."

   Moralisation: Stating genome editing as morally justified due to its capacity to address the pressing issues of food scarcity and insecurity, which can positively impact the lives of millions of Nigerians.

2. Point: "GEd agricultural products would help boost agricultural productivity, alleviate poverty, enhance the nutritional value of farm produce, and reduce

crops' vulnerability to pesticides and environmental stress as well as the dependence on fertilizers."

Moralisation: Structuring genome-edited agricultural foods as a morally justifiable solution to various societal challenges, such as poverty decline, improved sustenance, and reduced environmental impact. This depicts genome editing as a means to accomplish social and ethical goals.

3. Point: "The meeting brought together stakeholders with backgrounds in science, technology, and innovation, most especially genome editing, to validate the work that has been done on genome editing in Nigeria."

   Moralisation: Presenting the partnership of stakeholders with expertise in science, technology, and innovation as morally appropriate, as it demonstrates a cooperative effort to ensure the safety and effectiveness of genome editing in Nigeria.

Rationalisation

The article takes up rationalization techniques by supplying logical reasoning and justifications for various aspects of genome editing in agriculture. It highlights the potential advantages, collaborative efforts, partnerships, adherence to guidelines, and enforcement measures in the following ways:

1. Point: "Nigeria will soon deploy genome editing technology in agriculture, which would help boost productivity and ensure food security."

   Rationalization: Genome editing technology is rationalized as a way to enrich agricultural productivity and food security, providing a logical link between the potential benefits of the technology and the pressing need to address the challenges of food scarcity.

2. Point: "GEd agricultural products would help boost agricultural productivity, alleviate poverty, enhance the nutritional value of farm produce, and reduce crops' vulnerability to pesticides and environmental stress as well as the dependence on fertilizers."

   Rationalization: The writing supports the rational argument by explaining how genome-edited agricultural products can lead to increased productivity, reduced poverty, improved nutrition, and reduced environmental impact. This logical reasoning supports the idea that genome editing can have multifaceted benefits.

Mythopoesis

The paper utilizes mythopoesis strategies by formulating a narrative that presents genome editing as a heroic endeavour, full of promise and prospects. This is seen in:

1. Point: "Nigeria will soon deploy genome editing technology in agriculture, which would help boost productivity and ensure food security."

   Mythopoesis: The essay introduces a narrative of hope and improvement by portraying genome editing as a transformative force that will uplift agriculture in Nigeria, developing a mythic vision of a future with improved productivity and food security.

2. Point: "GEd agricultural products would help boost agricultural productivity, alleviate poverty, enhance the nutritional value of farm produce, and reduce crops' vulnerability to pesticides and environmental stress as well as the dependence on fertilizers."

   Mythopoesis: The advantages of genome-edited agricultural foods are illustrated in a mythical manner, evoking a sense of wonder and possibility. The terminology used creates a story of improvements in agriculture that can magically alleviate poverty, boost nutrition, and safeguard crops from damage.

Conclusion

Theo Van Leeuwen's legitimation critical discourse analysis (CDA) methodology was used to analyse genome editing news stories in order to gain insight into how this revolutionary biotechnological development is portrayed and justified in the media. The study has uncovered a number of significant findings that provide a spotlight on the discursive framework of editing the genome in the news media and its consequences for the general public and political discussions. The findings of the paper include:

1. In portraying genome editing as a helpful and legal practice, the justification of genome editing technology depends heavily on expert judgement, empirical data, moral considerations, and symbolic narratives.
2. The study uncovers power disparities in the portrayal of various players and stakeholders involved in the debate on genome editing.
3. Media stories on genome editing frequently mention ethical issues.

Contributions to knowledge

The study offers a deeper understanding of the legitimation tactics utilised in news media reporting on genome editing by adopting Theo Van Leeuwen's legitimation CDA model. Second, the study adds to conversations about policy-making and ethical standards by examining how genome editing is framed ethically in the media. The research provides information on the possible social effects of genome editing technologies to stakeholders, policy-makers, and scientists.

Works Cited and Consulted

Ajaja, Tunde. "Nigeria Ready to Deploy Genome Editing Technology in Agriculture." *Punch Nigeria*, 12 July 2023, https://punchng.com/nigeria-ready-to-deploy-genome-editing-technology-in-agriculture-nabda/.

Clayton, Jay. *Literature, Science, and Public Policy: From Darwin to Genomic*s. Cambridge UP, 2023.

Conley, John M., et al. "The Promise and Reality of Public Engagement in the Governance of Human Genome Editing Research." *The American Journal of Bioethics*, vol. 23, no. 10, 2023, pp. 4-14.

Ghosh, Pallab. "What is Gene-edited food and is it Safe to Eat?" *BBC News*, 23 March 2023, https://www.bbc.com/news/science-environment-64559210.amp.

Jin, Shuai. "Responsive Propaganda: The Sharp Shift in the Propaganda of Human Gene Editing in China." *Journal of Chinese Political Science,* vol. 28, no. 2, 2023, pp. 231-250.

Karavolias, Nicholas. "GMOs and Gene Editing: What's the Difference?" *Alliance For Science*, https://allianceforscience.org/blog/2022/05/gmos-and-gene-editing-whats-the-difference/.

Koen, Beumer. "Inclusive Innovation in Crop Gene Editing for Smallholder Farmers: Status and Approaches." *Elementa: Science of the Anthropocene,* vol. 11, no. 1, 2023, pp. 89-91, https://doi.org/10.1525/elementa.2022.00089.

Martin, Asha. "Regulation of Genetically Modified and Gene-Edited Foods: An Overview." *Recent Advances in Food Biotechnology,* edited by Ajay Kumar, et al., Springer, 2022. https://doi.org/10.1007/978-981-16-8125-7_23.

Mosurska A., et al. "Disasters and Indigenous Peoples: A Critical Discourse Analysis of the Expert News Media." *Environment and Planning E: Nature and Space,* vol. 6, no. 1, 2023, pp. 178-201.

Roca, María M., et al. "Cisgenics and Genome Editing or Second Generation Biotechnologies: A Latin America and Caribbean Perspective." *Cisgenic Crops: Safety, Legal and Social Issues,* edited by A. Chaurasia, and C. Kole, Springer, 2023 https://doi.org/10.1007/978-3-031-10721-4_9.

Rock, Joeva S., et al. "Beyond the Genome: Genetically modified crops in Africa and the Implications for Genome Editing." *Development and Change,* vol. 54, no. 1, 2023, pp. 117-142.

Sukegawa, Satoru, et al. "Genome Editing in Rice Mediated by Miniature Size Cas Nuclease SpCas12f." *Frontiers in Genome Editing*, vol. 5, 2023.

Tenali, Srimayi, and Phil McManus. "Climate Change Acknowledgement to Promote Sustainable Development: A Critical Discourse Analysis of Local Action Plans in Coastal Florida." *Sustainable Development,* vol. 30, no. 5, 2022, pp. 1072 - 1085.

Thaldar, Donrich, and Bonginkosi Shozi. "An Imbalanced Approach to Governance? An Analysis of the WHO's Position on Human Genome Editing." *Bioethics*, vol. 37, no. 7, 2023, pp. 656-661. https://doi:10.1111/bioe.13193.

Van Leeuwen, Theo. "Legitimation in Discourse and Communication." *Discourse & Communication*, vol. 21, no. 2, 2007, pp. 193-223.

APPENDIX

Extract: 1

What is gene-edited food and is it safe to eat?

By Pallab Ghosh, *BBC News*, 23 March, 2023

The law has changed to allow gene-edited food to be developed and sold in England. The government hopes the technology will boost jobs and improve food production, but safety and environmental worries mean it is not allowed in other parts of the UK. What is gene-edited food?

For many years, farmers produced new varieties through traditional cross-breeding techniques. They might, for instance, combine a big but not very tasty cabbage with a small but delicious one to create the perfect vegetable. But this process can take years, because getting the hundreds of thousands of genes in cabbages to mix in just the right way to produce large but tasty offspring is a matter of trial and error. Genetic methods remove the random element.

They let scientists identify which genes determine size and flavour, and insert them in the right places to develop the new variety much more quickly. Which genetic techniques are used? Genetic modification (GM), which has been common in most parts of the world for more than 20 years, though not in the European Union (EU). GM involves adding genes to a plant's DNA from a different species of plant – or even an animal. It creates new varieties which could not have been produced through cross-breeding. Cisgenesis, which is like GM, but involves adding genes from the same or very closely-related species, which the new rules will allow if the resulting crop is something that could have been produced through traditional cross breeding.

Gene-editing (GE), which is a much newer technique that lets scientists target specific genes. The new law lets plant breeders switch them on or off by removing a small section of DNA – again, provided the resulting crop could have been naturally produced.

When will gene-edited foods be available in the UK?

Brexit let the government introduce much lighter regulations for gene-edited crops in England than are in place across the EU. But you will not see GE produce in shops straight away.

The technology is still relatively new, and it may take several years before new varieties are on sale. But they are on the way. The legislation also opens the door to the sale of meat, eggs and dairy from gene-edited animals. But MPs would have to

approve this separately, because the government is still considering the potential impact on animal welfare. There is no clear timetable for when this might happen.

The new rules do not require GE foods to be labelled as such, because Westminster considers them no different to conventional produce.So far, Scotland, Wales and Northern Ireland have not changed their laws on GE crops. Is opposition to GM food irrational? Gene-edited farm animals are on their way. What gene-edited food will I be able to buy? In Japan, you can already buy tomatoes rich in a chemical called GABA, which has a calming effect, and modified sea bream where more of the flesh is suitable for sushi. A US firm is developing seedless blackberries and stoneless cherries.

In the UK, researchers have developed tomatoes that contain vitamin D. Scientists in Hertfordshire have also been experimenting with gene-edited wheat. However, the food industry mainly wants to use GE technology to speed up the development of new varieties of current crops. Firms also want to be able to tailor crops more precisely: producing starchier potatoes for crisp-makers, or protein-rich veg to use as a meat substitute.

Companies are also keen to introduce traits that improve yields, and to create varieties that are more resilient to climate change. Four ways climate change is affecting weather. Should we stop eating meat to fight climate change? Are gene-edited foods safe? Scientists insist that each of the three genetic techniques produces food that is safe to eat, and point out that all food is rigorously tested. They argue that GM crops have been consumed by billions of consumers in North and South America and Asia for more than 25 years with no ill-effects. However, concerns over health risks and the environmental impact have meant that neither GM nor GE crops can be commercially produced or sold in the EU, although there are some signs that this may change.

What are the safety concerns?

Many campaigners who are opposed to gene-edited foods make no distinction between these and those produced by the earlier GM technology.

They are worried that GE foods will not require additional testing, and fear the creation of new allergens or toxins. They are also concerned about the impact GE crops could have on the environment. However, scientists say that there is no evidence that GM crops have harmed human health or damaged ecosystems, and they expect the same to be true for GE crops. The Westminster government believes that because gene-edited produce is indistinguishable from natural varieties, they will face less

opposition than their GM equivalents. Recent unpublished polling by YouGov for the Department for Food and Rural Affairs (Defra) backs this view, but a large minority remains opposed: 54% said GE crops were "acceptable"

28% said they were "unacceptable" The polling also found that 78% were in favour of some environmentally-beneficial applications of GE, such as the reduced use of pesticides and herbicides. But there was less support for the use of gene-editing in animals, over fears the technology might cause suffering

Extract: 2

Nigeria Ready to Deploy Genome Editing Technology in Agriculture — NABDA

12th July 2023, Tunde Ajaja, *Punch Nigeria*

The Director-General, National Biotechnology Development Agency, Prof Abdullahi Mustapha, says Nigeria will soon deploy genome editing technology in agriculture. This, he said, would help to boost productivity and ensure food security. Speaking in Abuja on Tuesday at the commencement of the validation workshop to review the draft of the genome editing national communication and advocacy strategy and action plan, Mustapha stated that as soon as the strategy was validated, Nigeria was ready for implementation.

At the programme, held in partnership with the African Union Development Agency, were researchers from various institutes and ministries, farmers, lecturers, civil society and faith-based organisations and regulators like the National Biosafety Management Agency.

Also present were representatives of the National Orientation Agency and the National Agency for Food and Drug Administration and Control. The organisers stressed that Ged agricultural products would help to boost agricultural productivity, alleviate poverty, enhance the nutritional value of farm produce, and reduce crops' vulnerability to pesticides and environmental stress as well as the dependence on fertilizers. Mustapha noted that the convergence of the stakeholders was to enrich the inputs in the national communication strategy before its adoption.

He stated, "The meeting brought together stakeholders with backgrounds in science, technology and innovation, most especially genome editing, to validate the work that has been done on genome editing in Nigeria. It's a new technology that has cut across the continent, and if harnessed, will transform the continent in terms of science, technology, and innovation.

"So, we partnered with the AUDA-NEPAD to see how we can make a success of this innovation. We also invited journalists, who are the ears and eyes of society, to join in validating the communication strategy and the roadmap."

"This initiative began in Nigeria in October 2022 and once it is validated, we swing into action and start the implementation. So, this workshop is to examine a critical aspect of Ged for the effective communication of the benefits, risks, and ethical considerations to the Nigerian public." Also, the Director-General, NBMA, Dr. Agnes Asagbra, said the agency had developed the guidelines, which researchers were expected to follow "and when they do not conform to the guidelines, we will wield the big stick."

She added, "We have a Memorandum of Understanding with Customs to ensure that unlicensed Ged products do not make it into Nigeria. So, we have the Ged guidelines that will ensure that Ged products do not impact negatively on people's health and well-being.

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